

THE EFFECT OF THE SUBJECT'S CONCEPTION
OF THE TIMING ON THE WECHSLER ADULT
INTELLIGENCE SCALE

C.S. BERNHARDSON

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THE EFFECT OF THE SUBJECT'S CONCEPTION
OF THE TIMING ON THE WECHSLER ADULT
INTELLIGENCE SCALE

A Dissertation

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Clemens S. Bernhardson B.A.

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ABSTRACT

This study attempted to study the effects which different conceptions of the time element involved in four subtests of the Wechsler Adult Intelligence Scale (WAIS) might have on the subject's score. In order to induce the idea that accuracy was the main emphasis, two subtests were given each subject in such a manner that he did not realize that he was being timed. Two other subtests were administered in such a manner that the subject realized he was being timed. This was to induce the idea that not only accuracy but also speed was important. It was hypothesized that those who realized they were being timed would tend to obtain a higher scaled score due to earning more time bonus points.

When each subject's two timed subtests were compared with his two untimed subtests, it was found that the average scaled score was higher on the untimed subtests. There was no significant difference in accuracy points while the untimed subtests had significantly more time bonus points. Thus it was concluded that the subjects tended to obtain a higher scaled score on the untimed subtests due to obtaining significantly more time bonus points. However an examination of the individual subtests showed no significant difference for the individual subtests between the two experimental conditions. The difference which was found for the untimed subtests would

probably not affect the full scale IQ enough to result in a different appraisal of the level of intelligence.

It was found that the males showed no significant difference in their performance in the two experimental conditions. However the females obtained significantly more scaled scores on their untimed subtests. The difference in accuracy points was not found to be significant while the untimed subtests yielded significantly more time bonus points. Thus it was concluded that the females obtained a significantly higher scaled score on the untimed subtests due to obtaining significantly more time bonus points. The difference was not thought to be great enough to cause a different appraisal of the full scale IQ.

The males received significantly more scaled scores, accuracy points and time bonus points than the females on the timed subtests. A similar comparison for the untimed subtests showed no significant differences. It was concluded that the differences on the timed subtests were due to a difference in the level of function of the areas measured by the subtests.

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CHAPTER I

THE PROBLEM AND DEFINITIONS OF TERMS USED

In the administration of the Wechsler Adult Intelligence Scale (WAIS)¹ an attempt has been made to standardize the conditions of the testing situation for all the subjects. In general this has been accomplished to a high degree. However it appears that subjects may view the time element aspect of the test in various ways. This is especially true of subtests in which the subject is timed by the examiner. One subject may feel that his score is dependent on how fast he works and as a result he will work as fast as he can. Another subject may feel that he has a generous time-limit in which to solve the problem and as a result he may work at a less hurried pace in an attempt to make sure his answer is accurate. Still another subject may not realize that he is being timed and, since he feels the emphasis is on accuracy alone, he will work slowly to make sure he comes up with a correct solution. So far there have been no experimental studies which have attempted to determine if the subject's conception of the time element has any significant influence on his test score.

¹The abbreviation, WAIS, will be used henceforth to designate the Wechsler Adult Intelligence Scale.

I. THE PROBLEM

Statement of the problem. It is the purpose of this study to determine the effect of the subject's conception of the time element on his test performance. By varying the mode of timing, two different conceptions will be induced. Thus this study will compare the effects of the conception that the emphasis is on accuracy and the conception that not only accuracy but also speed is important.

It is possible that the subjects who realize that speed is also important will tend to work faster and thus earn more time bonus points. However there should be no significant differences in accuracy points while the scaled score will be higher due to the time bonus points. As an hypothesis this may be stated as follows: Under the experimental conditions, the subjects will tend to obtain a higher scaled score on the timed subtests due to obtaining more time bonus points. In addition, the individual subtests will be examined to determine how such an increase in time bonus points will be distributed among the individual subtests.

An attempt will be made to determine if males and females both show an increase in time bonus points on the timed subtests. In addition a comparison of the two sexes will be made on each experimental condition.

Importance of the study. It is felt that the time

element involved on four subtests of the Wechsler Adult Intelligence Scale (WAIS) could be conceived in different ways by different subjects. In order to induce an attitude that speed as well as accuracy is important, timing will be done openly so the subject realizes he is being timed. In addition, timing will also be done in such a manner that the subject does not realize that he is being timed. This is in order to induce the attitude that accuracy is important. Thus we will be able to study the effects of two different conceptions which could possibly arise. The difference should show up in the number of time bonus points obtained. Since there are thirty-one time bonus points available on the WAIS, it is felt that this difference could be considerable. For example, assume that a nineteen year old subject worked slowly and obtained only the accuracy points on the subtests on which time bonus points were available. Assume also that his full scale IQ was 119. If he were credited with all the available time bonus points his full scale IQ would become 132. Of course this is an extreme example but it does show that there is a possibility for the subject's conception of the time element to affect the test performance.

In addition there have been slight variations with regard to the method of timing in the administration of this test. Wechsler's manual (22.) does not specify the exact manner in which the subjects are to be timed. As a result,

there seems to be two general methods of timing subjects on the timed subtests. One method consists of the examiner timing the subject openly with a stop watch in such a manner that the subject can easily see that he is being timed. The other general method consists of timing the subject in such a manner that he does not realize that he is being timed. This is done by such methods as the examiner glancing at the sweep second hand of his wrist watch, glancing at the second hand of a large wall clock behind the subject in the examination room or even by counting to oneself in an attempt to estimate the number of seconds taken by the subject to complete the task. Examiners tend to feel that the different methods used yield comparable results. This study will enable us to consider experimentally whether or not their hunch is correct.

II. DEFINITIONS OF TERMS USED

Subtest. A subtest on the Wechsler Adult Intelligence Scale (WAIS) consists of a relatively homogenous group of questions or problems placed together within the test which are designated by a name which indicates the distinctive nature of their contents. For example the Arithmetic subtest is composed of a group of arithmetic problems while the Object Assembly subtest involves putting together four objects which have been cut up somewhat like a jigsaw puzzle.

The WAIS consists of eleven subtests.

Accuracy points. Accuracy points are those raw score points which are given for correct answers on the Wechsler Adult Intelligence Scale. The greatest part of a subject's total raw score is composed of accuracy points as all eleven subtests are scored in terms of accuracy points. However four subtests have time bonus points in addition to accuracy points.

Time bonus points. On four subtests of the WAIS time bonus points are given in addition to accuracy points. They are those raw score points which are given for speed of performance when the answer is given within certain predetermined time intervals. Not all of the questions within these four subtests have time bonus points. Instead they are generally given only for the more difficult questions. The Object Assembly subtest is an exception to this rule as some time bonus points are given for all its questions. Generally more than one time bonus point is given per question so a really fast performance will earn more than one time bonus point, and a slightly slower performance will earn only one time bonus point while a still slower performance which takes up most of the time limit will earn only the accuracy points. The following is the number of time bonus points available on the subtests, Arithmetic subtest, four points; Block Design

subtest, eight points; Picture Arrangement subtest, four points; and Object Assembly subtest, fifteen points.

Scaled score. Scaled scores are the raw scores for the respective subtests which have been converted by means of a table given by Wechsler to a system of scores which has a mean of ten and a standard deviation of three. In this manner the scores of all eleven subtests become comparable, because the raw scores for each subtest are transformed to the same scale. For example, obtaining the same scaled score on each of two subtests indicates that the person was operating at the same level in the two functions measured by the respective subtests.

Timed subtests. a. Traditional usage. According to general usage timed subtests are those subtests of the WAIS for which the examiner times the length of time taken for the performance of the task.

b. Special usage. In this study timed subtests are divided into two types from the point of view of the subject who takes the test. The subtests which are timed in such a way that the subject realizes he is being timed are called timed subtests. This special use of the term should not cause any misunderstanding since all the subtests used in this experiment with the exception of the information subtest which was used as a pre-test for matching the subjects

are timed subtests in the traditional use of the term and are merely designated as timed or untimed depending on whether or not they are administered in such a way that the subject thinks they are timed or not timed.

Untimed subtests. Untimed subtests are timed subtests (in the traditional use of the term) which are timed in such a way that the subject does not realize that he is being timed. Hence from the subject's point of view these subtests appear to be untimed and the subject reacts to them in much the same way that he would react to subtests which actually were not timed.

Differential ability. This is a term used in this study to designate the fact that in general subjects do not function at exactly the same level in all the areas tapped by the different subtests. Instead they tend to be slightly better in some areas than in other areas. This differential ability shows up in the scaled scores as the subject seldom gets the same scaled score for all his subtests.

III. ORGANIZATION OF THE REMAINDER OF THE THESIS

The remainder of this thesis will consist of four more chapters.

Chapter II will consist of a survey of the literature. Studies concerning the time aspect and sex differences on

intelligence tests will be covered as well as a survey of Wechsler's manuals.

Chapter III which deals with the procedure will consist of five parts. The first part will deal with a description of the WAIS subtests which were used in this study. Then the administration procedure will be discussed. This will be followed by a discussion of the two experimental conditions. Next the manner of scoring used on the subtests will be discussed. Finally an outline of the treatment of the data will be given.

Chapter IV will deal with the results. The first part will consist of a comparison of the timed and untimed subtests of all seventy subjects. This will be followed by a comparison of the results obtained when the specific subtests are given as timed or as untimed subtests. Next the subjects will be grouped on the basis of sex and the performance on timed and untimed subtests will be compared for each sex. Finally a smaller matched male--female group will be set up so that the performance of boys can be compared with that of girls on timed subtests. The same comparison will be made for the untimed subtests.

Chapter V will deal with the summary and conclusions. It will consist of three parts. The first part will consist of a summary of the procedure used while the second part will consist of a summary of the conclusions drawn from this study. The final part will deal with recommendations.

CHAPTER II

SURVEY OF THE LITERATURE

A survey of the literature reveals that there has not been any work done on the specific problem which is under investigation in this study. However there is some experimental work which is relevant to our problem. This includes some work on different aspects of the time element and several works on sex-differences. In addition to the experimental work, a mention of Wechsler's manuals is also relevant.

Studies related to the time aspect. In a study by J.P.S. Robertson and K.J. Batcheldon (15, pp. 612-618) which primarily sought to determine if there is a significant difference in level of difficulty between American and British subjects, a short addendum was added on speed. They felt that British subjects tend to emphasize accuracy rather than speed unless the instructions strongly emphasize the speed aspect. To illustrate this belief, they cite some data based on the Digit Symbol subtest. The Digit Symbol subtest scaled scores were obtained for sixty-eight patients aged twenty to thirty-nine. These subjects had been tested at Netherne Hospital between 1952 and 1954. They were selected because there was no reason to suspect intellectual deterioration. The scaled scores on the Digit Symbol subtest were

compared with the mean scaled score on the other tests. They found that the Digit Symbol subtest scaled scores were below the mean scaled score of the other subtests approximately two-thirds of the time. These authors do not mention whether or not the subjects could see the stop watch and therefore realize they were being timed. However the very nature of the instructions would seem to indicate to the subjects that the aim of this subtest was to work quickly. It seems quite possible that the subjects thought accuracy was more important than speed and as a result they obtained a poorer score than they would have if they had tried to work as fast as they could. Thus it seems that the time element is not structured sufficiently so all subjects who take the test regard it in the same manner. This study seems to support the view that there can be variations in the subjects' conceptions of the time element and that these variations can influence the score they obtain.

A.W. Siegman (19, pp. 176-178) did a study on the effect of manifest anxiety on concept formation, nondirected learning and timed and untimed intelligence tasks. We will only examine the last aspect of this study. Thirty-five medical and psychiatric patients were administered the WAIS and the Taylor MAS.² The ten highest and the ten lowest

²The Taylor Manifest Anxiety Scale.

scorers on the Taylor MAS were selected for a special study. Their performance on the WAIS subtests which had time limits (Arithmetic, Digit Symbol, Picture Completion, Picture Arrangement, Block Design and Object Assembly) were compared with the remaining subtests which did not have time limits. He found that those who scored high on anxiety did poorer on the timed subtests. This difference was significant at the .05 level. Those who scored low on anxiety had a higher average on their timed subtests but this difference was not statistically significant. This study indicates that there was a difference among the subjects of this study in their reaction to timed and untimed subtests. However it is difficult to predict on the basis of this study how the subjects in the present study will react to timed and untimed subtests.

The Wechsler manuals. The instructions for the administration of the Wechsler tests have been well set out in the manuals (22, 23, 24, 25, 26). However it seems that the instructions could leave room for different conceptions concerning the time element. These manuals have never designated whether or not the timing was to be done in such a manner that the subject could readily see that he was being timed. If the subject was unaware that he was being timed, he would have to infer the importance of the time element mainly from the instructions. This could possibly result in a wide

variety of different attitudes from subject to subject. Even if the subject realized he was being timed his performance could possibly be different if he thought that he merely had a time limit in which to attempt the problem than if he thought he would get extra points if he worked extra fast. Since the manuals do not seem to rigidly structure the time element, it seems possible that this could result in varying attitudes toward the time element. These attitudes could possibly have an influence on the score which the subject obtains.

Studies concerning sex differences. There have been studies which have indicated the presence of sex differences in areas other than reaction to timed or untimed subtests. The bulk of these studies seem to have been undertaken to determine whether one sex scores significantly higher than the other (2, 5, 6, 12, 21, 24). These studies are rather far removed from the topic under consideration in this study. However they seem to indicate that, since there are sex differences in other areas of performance on Wechsler tests, there could possibly be sex differences in the reaction to timed as contrasted with untimed subtests.

CHAPTER III

PROCEDURE

This chapter will contain a description of the subtests which were used, a discussion of the procedure used in administering the subtests, a discussion of the two experimental conditions, a statement concerning the manner of scoring the performances and an outline of the treatment of the data.

I. DESCRIPTION OF THE SUBTESTS

The five subtests used in this study were all from the Wechsler Adult Intelligence Scale (WAIS). This test is one of the most widely used intelligence tests. In addition, skilled examiners sometimes use it in a diagnostic manner to obtain an indication of the subject's personality features. This test is especially applicable to adults since it is a point scale and it has been standardized on a total of 850 males and 850 females between the ages of 16 and 64 years of age. This sample was made representative of the general population by means of a stratified sampling procedure based on the United States census of 1950. In general the WAIS is considered to be a reliable and valid measure of intelligence.

Of the eleven WAIS subtests, the following five subtests were used; Information, Arithmetic, Block Design, Picture

Arrangement and Object Assembly. The Information subtest was used as a pre-test by which to match pairs of subjects on their general level of intelligence. The other four subtests were selected because they are the subtests on which time bonus points are available.

The Information subtest consists of a number of questions which tap the subject's general fund of information. These questions range from a question concerning the colors of the American flag to very difficult questions. As this subtest is part of a test which originated in the United States, some of the questions seem to discriminate against Canadian subjects. As a result, it has become standard practice in Canada to substitute what appears to be the Canadian equivalents of the decidedly United States oriented questions. In this study the Canadian equivalents were substituted as follows. Question eleven which asks concerning the height of the average woman was changed so it asked for the height of the average Canadian woman. Question fourteen which asks concerning the date of George Washington's birthday was changed so it asks for the date of Queen Victoria's birthday. Other questions could have also been changed. However it was felt that it would be best to leave as many unchanged as possible.

The Arithmetic subtest consists of fourteen arithmetic problems which the subject is asked to work out in his head

without the aid of paper and pencil. The questions deal with such everyday topics as determining how much change should be given back after a purchase or changing feet to inches. The skill in Arithmetic which is necessary for solving these problems should have been acquired in grade school or by adults as a result of their everyday transactions.

The Block Design subtest consists of arranging blocks so the color combinations on their top surface makes the required designs. All the blocks are identical and have two sides which are completely red, two sides which are half red and half white with the color division running diagonally across the face of the blocks. Ten colored designs were printed in a small coil bound book. Each of these designs is shown in turn to the subject and he is asked to duplicate the design by arranging the blocks he has been given so that the colors of the tops of the blocks match the design.

The Picture Arrangement subtest consists of a series of pictures which must be arranged in the correct order so they show a meaningful sequence. These pictures have been drawn by an artist and resemble the type of drawing which is seen in comic strips. The subject must arrange the pictures so the sequence of action from one picture to the next will be meaningful.

The Object Assembly subtest consists of four objects which have been cut into five to seven pieces. The pieces

for each object are laid out in front of the subject in a standardized manner. Then the subject must attempt to arrange the pieces in such a manner that they make the correct object.

II. ADMINISTRATION OF THE SUBTESTS

The five subtests were administered by the author to seventy-four subjects. These subjects were obtained from two introductory psychology classes,³ at the University of Alberta. The experimenter visited each of the classes and explained that he needed subjects for a thesis experiment. The prospective subjects were given the idea that this was a study to determine how normal subjects of University level would make out on five parts of an intelligence test. They were instructed in this manner so they would not realize that the aspect of timing was being studied. After the explanation, time tables were passed out and those who were willing to be subjects were asked to indicate what times they would be available. Then the experimenter phoned the subjects to arrange an appointment.

The five subtests were administered in a standard order for all subjects. This order was as follows, Information, Arithmetic, Block Design, Picture Arrangement and Object Assembly. These subtests are in their usual order of administration for the whole WAIS. However the Comprehension subtest has been omitted from between the Information and

³Psychology 40. Introduction to General Psychology and Psychology 42. General and Developmental Psychology.

Arithmetic subtests and the Similarities, Digit Span, Vocabulary, Digit Symbol and Picture Completion subtests are missing between the Arithmetic and Block Design subtests.

In general the subtests were administered following the instructions given by D. Wechsler in his Manual For The Wechsler Adult Intelligence Scale. However there were two modifications of his instructions. The first concerned the administration of the Block Design subtest. If the subject was unable to finish a design before the time limit expires, the manual designates that he should be stopped when the time limit has expired. It was felt that stopping the subjects who did not realize they were being timed would tend to give them the idea that they were being timed. As a result they would possibly hurry faster on the following designs so they could finish them before they were stopped. This would mean that the subjects who were stopped because they did not finish within the time limit would not react to the subtest as if it was untimed. This same procedure was followed when this subtest was given as a timed subtest in order that the administration would be as much the same as possible for both groups. If the subject did not appear to be having very much success with the design he was asked if he wanted to leave it and go on to the next one. It was felt that this slight departure from the regulation administration was permissible because it is much the same as the standard administration

of D. Rappaport (14, p. 276). He allows the subject to go beyond the time limit and helps him a bit if necessary. The performance after the time-limit does not add to the subject's quantitative score.

The second departure from the usual manner of administration concerned the manner of administering the Object Assembly subtest. The regulation administration consists of laying the pieces out behind a shield which prevents the subject from watching this procedure. Then, once the pieces are all laid out, the screen is removed so the subject can see the pieces. However this method is somewhat inconvenient and moreover it is difficult to lay the pieces out in exactly the same configuration every time. As a result a cardboard template was made with cut-outs for the pieces of the Object Assembly subtest. A cardboard folder was made to keep the pieces from falling out of the template. In the administration, the folder was placed on the table and the template pulled out of it. When the template was lifted up, the pieces were left in the correct positions in front of the subject. In this manner the pieces could be easily positioned in the correct lay-out. It was felt that it was permissible to modify the standard administration because similar methods have been suggested by other administrators of this test. B.R.A. Sappenfield (16, p. 301) suggested a method of placing the pieces into cut-outs made in cardboard in order

that the pieces be accurately placed. W. Shannon and P.D. Rossi (17, pp. 413-415) and G.F. Derner and M. Aborn (3, pp. 71-72) have suggested methods by which the pieces are held in a template. Thus the template can be turned over on the table. When the template is lifted, the pieces are correctly positioned for the subject.

III. THE TWO EXPERIMENTAL CONDITIONS

For the present study there were two experimental conditions. The same five subtests were given to all the subjects. However the manner of timing the subtests was different. In condition I the subject was first given the Information subtest as a pre-test, then the Arithmetic subtest as a timed subtest, then the Block Design and Picture Arrangement subtests as untimed subtests and finally the Object Assembly subtest as a timed subtest. This manner of presentation is shown schematically in Figure 1.

Pre-test	Timed	Untimed		Timed
Information	Arithmetic	Block Design	Picture Arrangement	Object Assembly

FIGURE 1
CONDITION I

In condition II the subject was also given the Informa-

tion subtest as a pre-test. However this was followed by the Arithmetic subtest which was given as an untimed subtest, then by the Block Design and Picture Arrangement subtests given as timed subtests and then by the Object Assembly subtest given as an untimed subtest. The manner of presentation of condition II is shown schematically in Figure 2.

Pre-test	Untimed	Timed		Untimed
Information	Arithmetic	Block Design	Picture Arrangement	Object Assembly

FIGURE 2

CONDITION II

The Information subtest was chosen as a pre-test for matching the subjects because of three reasons. First of all, it can be easily and accurately scored. Thus each subject's score on this subtest can be quickly determined so he can be placed in the correct experimental condition without a long delay. Secondly, it has a high correlation with the full scale score on the WAIS. Therefore it would give a relatively accurate indication of the subject's level of intelligence in order that the two groups of subjects may be equated on this factor. Thirdly, it also correlates fairly evenly with the four subtests which were used in this study. Thus it can be thought of as a pre-test which will give some indica-

tion of the subject's level of function on the four subtests in order that the two groups may be equated in this respect.

The scaled score on the Information subtest was first determined for each subject. This was for matching purposes as the matched pair method was used for equating the subjects for the two experimental conditions. For each subject in condition I with a given scaled score on the Information subtest there was another subject in condition II with the same Information subtest scaled score. Table I illustrates the distribution of Information subtest scaled scores for the two experimental conditions. The first subject who obtained a given Information scaled score was given the administration by the condition I method. Then the second subject who obtained that same scaled score on the Information subtest was given the administration by the condition II method. Then the third subject who received that same Information scaled score was placed in condition I etc. Thirty-five pairs were needed for this study so subjects were run until thirty-five pairs had been matched up. Thus it was necessary to run a total of seventy-four subjects. The four subjects who remained unmatched were disregarded and the statistical treatment only dealt with the thirty-five pairs. Table II shows a comparison of the two conditions on various factors.

TABLE I
DISTRIBUTION OF INFORMATION SUBTEST SCALED SCORES

Scaled Score	Number of Subjects	
	Condition I	Condition II
11	2	2
12	6	6
13	12	12
14	9	9
15	4	4
16	2	2

TABLE II
A COMPARISON OF THE SUBJECTS IN CONDITION I
AND CONDITION II WITH RESPECT
TO VARIOUS FACTORS

		Condition I	Condition II
Sex	Male	20	13
	Female	15	22
Age	19 yrs. and younger	22	25
	20 yrs. and older	13	10
Year of Course	First	23	22
	Second	8	10
	Third	1	1
	Fourth	3	2
Area of Study	Arts	20	22
	Sciences	8	4
	Nursing	4	3
	Physical Education	0	3
	Engineering	3	2
	Household Ec.	0	1
Psychology Class	Psych. 40	27	26
Enrolled in	Psych. 42	8	9

Timed subtests, as this term is used in this study, designates those subtests which are timed in such a way that the subject realizes that he is being timed. To do this timing a stop watch was used by the examiner. During the administration of the Information subtest, this stop watch was placed on the table in plain view of the subject. Then when the subject was given timed subtests this watch was picked up and held in plain view in the experimenter's hand. For the untimed subtests this stop watch was left on the table so the subject could realize that it was not being used to time him.

The untimed subtests, as this term is used in this study, designates those subtests which were timed in such a manner that the subject did not realize he was being timed. To accomplish this end, a hidden stop watch was consulted by the examiner. Since it was thought that the ticking or the sound of the starting, stopping or clearing of the hidden stop watch might possibly betray the presence of the watch, the watch was placed in a sound proof box. Thus the subject could hear no noise from the watch. This box was made of three-quarter inch plywood and sound proofed with cotton batten. Three pieces of window glass were set up so the examiner could look into the box to read the stop watch. Depressing the stem of the watch part way in would stop the watch, while depressing it all the way in would clear the

watch. A mechanism was set up so the experimenter could pull a wire which protruded outside the box and a piece of metal would be pulled against the stem of the watch. Thus the stop watch was as easy to operate as if it had been held in the hand in the usual manner.

Since the sound proofing box was fairly large (12" x 11 $\frac{1}{2}$ " x 14"), it was placed on a chair beside the experimenter. A screen was set up so that a person sitting in the subject's position could not see that this box had a glass opening in the top of it. Before the subject came into the room and before he stood up to leave, a manual or clip board was placed on top of this box. Thus even with the subject in a standing position there was no possibility for him to notice that this box had a glass opening in the top and therefore become suspicious of the box. To the subject the box merely looked like a box which had been placed on a chair to make it the same level as the table so the experimenter would have more space to put his books. Figure 3 is a diagram which shows the arrangement in the experimental room.

Questions which the subjects raised were handled in the manner that they are usually handled during the administration of the WAIS. Since the aspect of timing was so important in this study, regulations were formulated concerning the handling of any questions concerning timing. If a

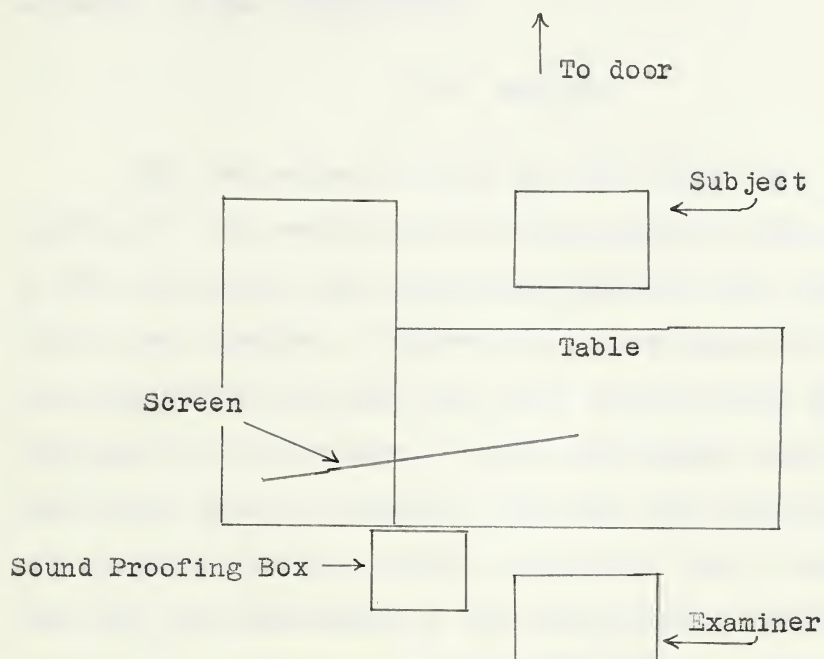


FIGURE 3

DIAGRAM OF THE EXPERIMENTAL SITUATION

subject asked if he was timed while he was being given an untimed subtest, he was answered in the negative. If the same question was asked concerning a timed subtest, he was answered in the affirmative.

IV. SCORING

All the subtests given in this study were scored according to the scoring instructions given in the manual (22). In the scoring of the Information subtest only accuracy points were awarded. However in the scoring of the other subtests there are some time bonus points which are given for speed of performance. On the Arithmetic subtest one time bonus point is given on the last four questions if they are answered within a certain period of time. On each of the last four questions of the Block Design subtest one or two time bonus points are available. A quicker performance is required to obtain two time bonus points than to obtain one. The same is true of the last two questions on the Picture Arrangement subtest. In addition there is one secondary arrangement on each of these questions which will earn some accuracy points but do not make the subject eligible for time bonus points. There are from three to four time bonus points available on each of the four problems in the Object Assembly subtest. Time bonus points are available on the Object Assembly subtest only if the subject has earned all

the possible accuracy points on that item. The time bonus points which have been discussed above are given in addition to the accuracy points on these four subtests. Table III will show the number of time bonus points which are available for the different time intervals.

V. TREATMENT OF THE DATA

The main part of the treatment of the data consisted in comparing the results on the timed subtests with those on the untimed subtests. To compare the means, the t test for the significance of differences between correlated means of small samples was used. This method (11, pp. 225-226) simplifies the statistical work by using difference scores. For the comparison of variance the small sample method of variance ratio or F test (11, pp. 228-231) was used. Following McNemar the symbol, s , will be used to denote the best estimate of the population standard deviation.

To determine how males and females reacted to the experimental conditions a smaller matched group was made up from the original pool of seventy subjects. All the males were listed under their respective scaled scores on the Information subtest in the order in which they took the experiment. The same listing was done for the females. Then the pairing was redone so that for each scaled score on the Information subtest there would be a boy in one con-

TABLE III
THE INTERVALS IN WHICH TIME BONUS POINTS
ARE AVAILABLE ON THE WAIS

Subtest	Ques. Number	Number of Time Bonus Points			
		1	2	3	4
Arith- metic	11	1"-10"			
	12	1"-10"			
	13	1"-15"			
	14	1"-20"			
Block	7	31"-40"	1"-30"		
Design	8	46"-70"	1"-45"		
	9	61"-80"	1"-60"		
	10	61"-80"	1"-60"		
Picture	7	26"-40"	1"-25"		
Arrangement	8	16"-25"	1"-15"		
Object	1	16"-20"	11"-15"	1"-10"	
Assembly	2		36"-45"	26"-35"	1"-25"
	3		41"-50"	31"-40"	1"-30"
	4		31"-50"	21"-30"	1"-20"

dition and a girl in the other condition. Then subjects were dropped so there were the same number of boys as girls in each of the two experimental conditions. (See appendix B). The decision concerning which subjects were to be dropped was reached in the following manner. If subjects in any category needed to be dropped, the subjects in that category who received the administration of the experiment the last were dropped. This rematching resulted in a smaller group of forty-four subjects composed of twenty-two males and twenty-two females. Table IV shows the distribution of Information scaled scores in this new sample. A comparison of males and females in this smaller matched male--female group is shown in Table V.

When the F test was done to test the variance, it was found that the variance was significantly different between the two groups in this small male--female group. This difference in variance casts some doubt on the results obtained by the t test as one of the assumptions underlying this test is that the variance does not differ significantly between the two groups being tested. As a result the data were tested for significance by means of a nonparametric statistical test. The test which was used for this purpose was the Wilcoxon matched-pairs signed-ranks test (18, pp. 75-83).

In order to test the significance of t, Table III given by Fisher and Yates (4) was used. Snedcor's table

TABLE IV
DISTRIBUTION OF INFORMATION SCALED SCORES
IN THE SMALLER MATCHED
MALE--FEMALE GROUP

Information Scaled Score	Condition I		Condition II	
	Males	Females	Males	Females
11	0	0	0	0
12	1	1	1	1
13	6	6	6	6
14	3	3	3	3
15	1	1	1	1
16	0	0	0	0
Totals	11	11	11	11

TABLE V
A COMPARISON ON VARIOUS FACTORS OF THE TWO GROUPS
OF SUBJECTS IN THE SMALLER MATCHED
MALE--FEMALE GROUP

		Males	Females
Sex	Male	22	
	Female		22
Age	19 yrs. and younger	12	20
	20 yrs. and older	10	2
Year of Course	First	10	18
	Second	8	4
	Third	1	0
	Fourth	3	0
Area of Study	Arts	11	15
	Sciences	7	3
	Nursing	0	4
	Physical Education	1	0
	Engineering	3	0
	Household Ec.	0	0
Psychology Class	Psych. 40	17	18
Enrolled in	Psych. 42	5	4

(20, pp. 222-225) on the distribution of F was used to determine the significance of the F values which were obtained. Table G given by Siegel (18, p. 254) was used to determine the significance of T .

CHAPTER IV

RESULTS AND DISCUSSION

This section will consist of four parts.

Part one will consist of a comparison of timed and untimed subtests for all the seventy subjects. This will consist of a comparison of each subject's two timed subtests with his two untimed subtests.

Part two will consist of a comparison of results obtained when specific subtests are given as timed or untimed subtests. Each of the subtests appeared as timed subtests for thirty-five subjects and as untimed subtests for thirty-five other subjects. Those who took any specific subtest as a timed subtest were paired on the basis of scaled score on the Information subtest with someone else who took the same subtest as an untimed subtest. This will result in a study of thirty-five pairs for each subtest.

Part three will consist of a comparison of performance on timed and untimed subtests for each of the sexes. The original pool of seventy subjects was divided into males and females. Then each of these two groups had the performance on their two timed subtests compared with the performance on their two untimed subtests.

Part four consists of a study of sex differences in reaction to timed and untimed subtests. The subjects were

rearranged into a smaller group of forty-four subjects so each male is matched with a female who has the same scaled score on the Information subtest. Then the performance of the males on the timed subtests was compared with the performance of the females on the timed subtests. A similar comparison is made for the performance on the two untimed subtests.

PART I

TIMED SUBTESTS COMPARED WITH UNTIMED SUBTESTS FOR THE WHOLE GROUP

Each subject's two timed subtests were compared with his two untimed subtests. The number of subjects was seventy and each subject acted as his own control. The thirty-five subjects in condition I had the Arithmetic and Object Assembly subtests administered as timed subtests while the Block Design and Picture Arrangement subtests were administered as untimed subtests. The opposite was true for the other half of the subjects who were in condition II. They had the Arithmetic and Object Assembly subtests administered as untimed subtests while the Block Design and Picture Arrangement subtests were administered as timed subtests. Thus each subtest appeared as a timed subtest for half the subjects and as an untimed subtest for the other

half of the subjects.

The experimental design was such that the subjects taking the timed and untimed subtests were equated on the important aspects. Since each subject acted as his own control, the general level of intelligence for the subjects taking the timed and untimed subtests would be equated. Differential ability should not distort our results because the subjects were assigned to the two experimental conditions on the basis of the order in which they obtained their respective scores on the Information subtest. Thus it seems that chance would tend to distribute the subjects' better subtests so that the two conditions would be approximately equal in this respect. In addition anything such as motivation or fatigue which is a function of the position in the order of administration should not affect our results. This is because timed subtests appeared in any of the positions in the order of administration just as often as untimed subtests. Thus it seems that the timed subtests were reasonably equated with the untimed subtests on the relevant factors. As a result, any difference in results is attributable to a difference in the experimental conditions.

A comparison of the number of scaled scores, proportion of accuracy points and proportion of time bonus points obtained by each subject on his two timed and two untimed subtests is made in Table VI.

TABLE VI
THE MEANS OF THE TWO TIMED AND
TWO UNTIMED SUBTESTS

	Number of Scaled Scores	Proportion of Accuracy Points	Proportion of Time Bonus Points
Mean of Two Timed Subtests	23.59	.862	.415
Mean of Two Untimed Subtests	24.57	.880	.483
t	2.20	1.636	2.519
Level of Significance	> .05 < .02	> .50 < .10	> .02 < .01

A comparison of scaled scores is possible even though there is a different possible total of raw score points available on each subtest because of the fact that scaled scores represent raw scores which have been expressed on the same scale. Thus a scaled score of ten on a timed subtest represents the same level of ability as a scaled score of ten on another subtest. Or a scaled score of eleven on a timed subtest represents a slightly higher level of performance than a scaled score of ten on an untimed subtest. The average of each individual's sum of scaled scores on his two timed subtests was 23.59 while the average of each subject's sum of scaled scores on his two untimed subtests was 24.57. A t of 2.20 is found. This shows that the significance of the difference between these two means is greater than the .05 level but less than the .02 level. Thus, contrary to our hypothesis, we have found that subjects tend to obtain a higher scaled score on untimed than on timed subtests. However such a difference in scaled score could be due to a significant difference in accuracy points or a significant difference in time bonus points or a combination of both. Thus we will compare the accuracy points and time bonus points which were obtained under the two experimental conditions.

The proportions of accuracy points given in Table VI are based on the total number obtainable on the timed and

untimed subtests. For the subjects in condition I there is a total of forty-three accuracy points available on the timed subtests while a total of seventy-two accuracy points is available on the untimed subtests. For the other half of the subjects who were in condition II a total of seventy-two accuracy points was available on the timed subtests while a total of forty-three was available on the untimed subtests. An average proportion of .862 was obtained on the timed subtests while a slightly higher proportion of .880 was obtained on the untimed subtests. This difference results in a t of 1.636 which shows a significance below the .10 level. Thus the subjects tended to obtain slightly more accuracy points on their timed subtests. However this difference is not statistically significant if we take the .05 level as being necessary to show significance. As a result we can not say that a significant difference in the number of accuracy points obtained was the cause of the significantly higher scaled score on the untimed subtests.

The proportions of time bonus points in Table VI are based on the total possible number of bonus points available on the timed and untimed subtests. For the subjects in condition I there is a total of nineteen time bonus points available on the timed subtests while a total of twelve time bonus points is available on the untimed subtests. This is reversed for the other half of the subjects who are in con-

dition II because twelve time bonus points are available on their timed subtests while nineteen time bonus points are available on their untimed subtests. On the timed subtests an average proportion of .415 was obtained while an average proportion of .483 was obtained on the untimed subtests. This difference results in a t of 2.519 which is significant between the .02 and .01 levels. This is contrary to the hypothesis because it was felt that the subjects who realized they were being timed would tend to hurry more and thus obtain a higher scaled score because they obtained more time bonus points. However just the opposite was found. For some reason the subjects who did not realize they were being timed worked slightly faster and thus obtained more time bonus points. This resulted in a higher scaled score. It is hard to determine an explanation for this phenomenon. Perhaps performance on these subtests require functions which are easier to perform if the subjects are more relaxed and not trying to work too fast. As a result those who did not realize they were being timed would not be under any time pressure and would function more freely and as a result more rapidly. On the other hand those who realized they were being timed possibly felt they should go as fast as they could. Therefore they strained to work as quickly as possible and, instead of functioning loosely and quickly, they tended to tighten up and thus take more time.

It is interesting to examine a comparison of the variance. This is shown in Table VII. The small sample estimate of the population standard deviation was used in this table and is designated by the symbol, s . The untimed subtests show a slightly higher variance for scaled scores, accuracy points, and time bonus points. However these differences are not statistically significant. This could possibly indicate that the time element was approximately as equally structured for the timed subtests as for the untimed subtests. If this were not the case and it was less structured for one group of subjects it seems that the subjects would have approached the subtests in many different manners and thus there would be more variability in the scores. However this does not mean that the time element was structured in exactly the same manner for the timed as for the untimed subtests. The significant differences in the means of scaled scores and time bonus points seem to indicate that there was some difference in the manner of structuring the time element.

Since a significant difference was found in the number of scaled scores and the proportion of time bonus points, it is necessary to examine the practical significance of such a difference. This can be seen by examining the difference which giving the four subtests as timed or untimed subtests would make on the full scale IQ. To establish a score which

TABLE VII
THE VARIANCE OF THE TWO TIMED
AND TWO UNTIMED SUBTESTS

	Number of Scaled Scores	Proportion of Accuracy Points	Proportion of Time Bonus Points
s of Two Timed Subtests	4.12	.101	.223
s of Two Untimed Subtests	4.38	.111	.248
F	1.1302	1.1924	1.1256
Level of Significance	<.10	<.10	<.10

would have been obtained if the four experimental subtests had been given as timed subtests, the mean of the sum of the scaled scores on the two timed subtests was doubled. This manipulation was to make up for the fact that only two subtests were given as timed subtests. It assumes that the subjects would have averaged the same on all four experimental subtests as they did on only two subtests. Thus four subtests are given the scaled score which was averaged on the timed subtests. The same procedure was done for the untimed subtests as well. Since the full scale IQ tables are made up on the basis of a total of eleven subtests, it is necessary to substitute in a value for the remaining seven subtests. Each of these subtests was arbitrarily given a scaled score of twelve. This value was chosen because it represented the same general level of function as the timed and untimed subtests. The value of these seven subtests was held constant and the value of the timed or untimed subtests was added to see how this would affect the full scale IQ. Table VIII shows that adding the four timed subtests will result in a total scaled score of 131.18 while adding the value for the untimed subtests will result in a total scaled score of 133.14. These full scale totals were rounded to the nearest whole number and looked up in the full scale IQ tables. Since the age group of our sample overlapped several of the age groupings in the IQ tables, the total scaled scores

TABLE VIII
THE EFFECT OF TIMED AND UNTIMED
SUBTESTS ON THE FULL SCALE IQ

	Scaled Score		Total	IQ	
	Experimental Subtests	Remaining Subtests		18-19 yrs.	20-24 yrs.
Timed	47.18	84	131.18	114	112
Untimed	49.14	84	133.14	116	114

were looked up in the tables for those eighteen to nineteen years of age and also in the tables for those twenty to twenty-four years of age. If the total obtained when the timed subtests are substituted in is looked up in the IQ tables, an IQ of 114 is found for those eighteen to nineteen years old. However substituting in the value for the untimed subtests results in an IQ of 116. The same comparison for those in the twenty to twenty-four year old group results in IQs of 112 and 114. Thus substituting the value for the timed and untimed subtests shows a difference of two IQ points in the full scale IQ for both these age groups.

The purpose of this comparison is not to see if there is a statistically significant difference between these IQ values. Rather it is to see if the difference would be large enough to result in a different evaluation of the full scale IQ in an everyday testing situation. A comparison of the average values showed that only a slight difference was obtained. Since the full scale IQ on the WAIS is regarded by clinicians not as an absolutely accurate score but as an indication of an approximate level, it seems that the difference found between the experimental conditions would probably not result in a different appraisal of the full scale IQ for the majority of our subjects.

PART II

A COMPARISON OF INDIVIDUAL SUBTESTS AS
TIMED OR UNTIMED SUBTESTS

The performance on the individual subtests when the subtests are given as timed or untimed can now be compared. The results from the seventy subjects were arranged so that the results obtained when the subtest was given as a timed subtest could be compared with the results obtained when the subtest was given as an untimed subtest. The Arithmetic and Object Assembly subtests were received as timed subtests by those in condition I while those in condition II received them as untimed subtests. The Block Design and Object Assembly subtests were received as untimed subtests by those in condition I while those in condition II received them as timed subtests. Thus each subtest was given as a timed subtest in one condition and an untimed subtest in the other. As a result comparing the performance on any given subtest in condition I with the performance on that same subtest in condition II would result in a comparison of that subtest given as a timed and as an untimed subtest.

The experimental design equated the subjects in both the conditions on the relevant factors. The general level of intelligence was equated by means of matched pairs. The Information subtest was used as the basis for the matching

as each individual in condition I was matched with another individual in condition II who had the same score on the Information subtest. Thus for every subject who was given any subtest as a timed subtest there was another subject, matched on the basis of having the same Information scaled score, who was given that same subtest as an untimed subtest. This matching resulted in thirty-five pairs for each subtest. Differential ability should not distort our results because the order in which the subjects obtained their respective Information scores determined which subtests were timed or untimed for each subject. Thus, by chance, differential ability should balance out for each of the experimental conditions.

The position of the subtest within the order of administration should not influence the results. The subtests were administered in the same order for both conditions. As a result the position of any given subtest within this order would be the same regardless of whether it was given as a timed or as an untimed subtest. In the event that the position in the order of administration does somehow affect the scores, such an effect would be the same for any given subtest as a timed subtest and as an untimed subtest. Thus this factor would not affect the results. Therefore, as a result of the experimental design, any difference which is found between any given subtest when it is administered as

a timed or untimed subtest can be said to be attributable to the difference in the experimental conditions.

Table IX shows that the average scaled score for timed subtests was higher for the Picture Arrangement subtest while the untimed subtests yielded a higher score for the Object Assembly, Arithmetic and Block Design subtests. However even the most significant of these differences is not significant at or beyond the .05 level so none of these differences are considered to be statistically significant. When the number of accuracy points obtained when the respective subtests were given as timed subtests were compared with those obtained when the subtest was given as an untimed subtest, it was found that more accuracy points tended to be obtained on the subtests which were given as untimed subtests. By means of the t test it was found that even the most significant difference was not even significant at or beyond the .40 level. As a result it was concluded that none of the differences in number of accuracy points obtained were significant. A comparison of the time bonus points shows that the same average number of bonus points was obtained on the Arithmetic subtest for both experimental conditions. However more bonus points were obtained on the Block Design and Object Assembly subtests when they were given as untimed subtests, while more time bonus points were obtained on the Picture Arrangement subtest when it was given as a

TABLE IX
AVERAGE SCORES OBTAINED WHEN SUBTESTS ARE GIVEN
AS TIMED OR UNTIMED SUBTESTS

	Number of Scaled Scores	Number of Accuracy Points	Number of Time Bonus Points
Arith. timed	12.66	11.80	1.86
Arith. untimed	12.77	11.91	1.86
t	.207	.337	.401
Level of significance	<.50	<.50	<.50
B.D. timed	11.94	34.86	3.43
B.D. untimed	12.91	35.83	4.29
t	1.49	.773	1.538
Level of significance	>.20<.10	>.50<.40	>.20<.10
P.A. timed	11.89	26.34	1.09
P.A. untimed	11.80	26.57	1.06
t	.157	.260	.155
Level of significance	<.50	<.50	<.50
O.A. timed	10.69	25.80	6.69
O.A. untimed	11.66	26.49	8.03
t	1.329	.809	1.387
Level of significance	>.20<.10	>.50<.40	>.20<.10

timed subtest. However the statistical tests showed that none of the differences in time bonus points were significant. Thus it was concluded from this data that there were no significant differences in accuracy points or time bonus points and as a result there were no significant differences in the scaled scores.

Table X is a comparison of the variance of the timed and untimed subtests. The untimed subtests were the most variable with respect to scaled scores for three out of the four subtests. The same is true for accuracy points and time bonus points. Picture Arrangement was the only timed subtest which was most variable with respect to scaled scores and accuracy points while Object Assembly timed was more variable with respect to time bonus points. However none of these differences were even significant above the .10 level when the F test was used. Thus it was concluded that there is no significant difference in variance.

Since it was found that there was a significant difference in favor of untimed subtests when each individual's two timed subtests were compared with his two untimed subtests, it would seem that some of the above subtests should have shown a difference also. The reason no difference was found possibly has something to do with the different manner of treatment of the data. The data which yielded a significant difference consisted of seventy pairs as each indiv-

TABLE X
VARIANCE WHEN SUBTESTS ARE GIVEN
AS TIMED OR UNTIMED SUBTESTS

	Scaled Scores	Accuracy Points	Time Bonus Points
s of Arith. timed	2.17	1.23	1.06
s of Arith. untimed	2.20	1.27	1.14
F	1.0268	1.0609	1.1567
Level of significance	<.10	<.10	<.10
s of B.D. timed	2.46	4.83	2.29
s of B.D. untimed	3.21	5.93	2.77
F	1.7036	1.5045	1.4624
Level of significance	<.10	<.10	<.10
s of P.A. timed	2.63	4.35	.98
s of P.A. untimed	2.10	3.71	1.06
F	1.5745	1.3741	1.1571
Level of significance	<.10	<.10	<.10
s of O.A. timed	3.11	3.77	3.91
s of O.A. untimed	3.17	4.45	3.84
F	1.0375	1.3952	1.0370
Level of significance	<.10	<.10	<.10

individual's two timed subtests were compared with his two untimed subtests. In addition the total score for two subtests was compared with the total score for two other subtests. The data which showed no significant difference were the same data as that which showed a significant difference. However it was treated in such a manner that the comparison would be between the different subtests. As a result the number of pairs dropped from seventy to thirty-five and the scores used were the scores from single subtests instead of the total for two subtests. In addition each subject no longer acted as his own control but instead pairs were matched on the basis of Information subtest scaled score. This also means that the two sexes were not evenly distributed between the two experimental conditions for the individual subtests. Part three will show that there is a sex difference in this respect so this factor could possibly have entered in to obscure the results. Thus the different manner of treatment of the data necessary in order to compare each experimental subtest on the two experimental conditions could have made one unable to detect any statistically significant differences. The use of larger groups and a different experimental design would possibly enable one to detect any such differences on the individual subtests.

PART III
PERFORMANCE ON TIMED AND UNTIMED
SUBTESTS BY EACH SEX

We have seen that the subjects tend to earn a few more time bonus points when they do not realize they are being timed so we shall examine to see if there is any sex difference in the reaction to timed and untimed subtests. First all the subjects were separated into the two sexes. This resulted in a group of thirty-seven females and a group of thirty-three males. Then each individual's two timed subtests were compared with his two untimed subtests. Each subject acted as his own control in order to equate the general level of intelligence for both experimental conditions. For each of the sex groups, the number of subjects in each experimental condition is slightly different. Twenty of the males are in condition I while only thirteen were in condition II. Fifteen females were in condition I while twenty-two were in condition II. This uneven distribution of subjects between the two experimental conditions should not disturb the comparison between timed and untimed subtests because subjects are compared on timed and untimed subtests in both of the experimental conditions. What it amounts to is that the subjects were given one subtest as a timed subtest more times than as an untimed subtest or vice versa.

Nevertheless the comparison between timed and untimed subtests is still made for all the subjects.

Because of the uneven distribution of subjects between the two experimental conditions, the two experimental conditions are not equated with respect to the position of the subtests in the order of administration. For the males the timed and untimed subtests are in the condition I position of administration seven times more than the condition II position. The opposite is true for the females as seven more females are in condition II than in condition I. It is doubtful that this difference influences our results. The main reason for this is that the subtests in our study appear in the same order as in a full WAIS. When the full WAIS is given, there are generally no positions in the order of administration which are considered to be more or less favorable. Even if there were such differences, they should be minimized in our study because we used a shortened form of the WAIS. Thus it does not seem that the uneven distribution of subjects between the two experimental conditions should influence the results.

Differential ability should be balanced out by chance. This is because the subjects were assigned to the experimental conditions on the basis of the order in which they obtained their respective score on the Information subtest. Thus it seems that by chance the level of ability on the

particular subtests should be balanced out between the two experimental conditions.

This analysis of the experimental design leads one to believe that any difference in results between the two experimental groups is attributable to the difference in experimental conditions. The data from this comparison is summarized in Table XI. An examination of the males' data shows that they did slightly better with respect to scaled scores, accuracy points and timed bonus points on the untimed subtests. However when the significance of the difference between the means is tested by means of the t test, none of the differences were found to be statistically significant. The same is true of the variance for the males. The variance of scaled scores, accuracy points and time bonus points is slightly greater for the untimed subtests. However these differences were not found to be statistically significant when the F test was used.

The data for the females is a different matter. Again the averages of scaled scores, accuracy points and time bonus points are higher for the untimed subtests. This time differences are found to be significant. The difference between the means of scaled scores is significant between the .02 and .01 level. The difference between the proportion of accuracy points is significant between the .1 and .05 levels while the difference between the proportion of bonus

points obtained is significant above the .01 level. Thus there is no significant difference in accuracy points so the difference in scaled score appears to be due to a significant difference in the number of time bonus points. There were no significant differences found in the variance of the female subjects.

This study has shown that males and females tend to perform differently with respect to the experimental conditions. The timed and untimed conditions seemed to structure the time element in the same manner for the males as the males tended to perform much the same on both experimental conditions. In addition the two conditions seemed to be equally structured because there was no significant difference in the variance. The untimed subtests seemed to be structured in a different manner than the timed subtests for the females. This is because the females tended to obtain a higher scaled score on them due to obtaining more time bonus points. However the two conditions appear to be equally structured as there was no significant difference in the variance. It is hard to determine exactly why such a sex difference was found. It would seem to indicate that females perform better on these subtests when they are not trying to hurry because they tend to slow down whereas the performance of males does not seem to be affected by these conditions.

Even though a statistically significant difference has

TABLE XI
CENTRAL TENDENCY AND VARIANCE OF TIMED
AND UNTIMED SUBTESTS, BY SEX

	MALES N = 33			FEMALES N = 37		
	Number Scaled Scores	Proportion Accuracy Points	Proportion Time bonus Points	Number Scaled Scores	Proportion Accuracy Points	Proportion Time bonus Points
M.(timed)	25.18	.904	.505	22.16	.823	.331
M.(untimed)	25.52	.905	.530	23.73	.857	.452
t	.313	.036	.612	2.62	1.89	3.49
Level of Significance	<.6	<.9	<.5	>.02 <.01	>.1 <.05	>.01
S (timed)	3.57	.058	.214	4.09	.116	.217
S (untimed)	3.67	.076	.248	4.82	.131	.245
F	1.05	1.68	1.33	1.39	1.29	1.27
Level of Significance	<.10	<.10	<.10	<.10	<.10	<.10

been found, it is wise to examine if such a difference would affect the appraisal of test results in an everyday testing situation. This information is shown in Table XII. The average score which the females obtained as the sum of their two timed subtests was doubled. The same was done for the untimed subtests. This is to obtain a total score for the experimental subtests which would have been obtained if all four of the subtests had been given as either timed or untimed subtests. The assumption underlying this manipulation is that the subjects would obtain the same average score on the four subtests as they did on the two subtests. The remaining subtests were each arbitrarily given a scaled score of twelve. This figure was chosen because it represents the same approximate level of function as the experimental subtests. When the value for the timed subtests is added to the arbitrary score for the remaining subtests a full scale IQ of 113 is found for those eighteen to nineteen years old. Substituting in the value of the untimed subtests would result in a full scale IQ of 114. A similar comparison for the twenty to twenty-four year old group results in IQs of 111 and 112. Thus for each age group the mean value for either the timed or untimed subtests would make a difference of 1 IQ point for these two age groups. It seems doubtful that a difference in full scale IQ due to either of these experimental conditions would be large enough to cause a clinician in an

TABLE XII

THE EFFECT OF TIMED AND UNTIMED SUBTESTS
ON THE FULL SCALE IQ OF
THE FEMALE SUBJECTS

	Scaled Score		Total	IQ	
	Experiment- al Subtests	Remaining Subtests		18-19 yrs.	20-24 yrs.
Timed	44.32	84	128.32	113	111
Untimed	47.46	84	131.46	114	112

everyday testing situation to appraise the full scale IQ in a different manner.

PART IV

SEX DIFFERENCES IN REACTION TO THE EXPERIMENTAL CONDITIONS

A comparison of the performance of males and females on timed subtests and also on untimed subtests can now be made. In order to make this comparison the original pool of data was rearranged so that a male was matched with a female who had the same scaled score on the Information subtest. Previously subjects had been matched on the basis of Information scaled score without regard to sex so that members of a pair could be of the same sex. The same number of each sex was placed in each experimental condition. This resulted in a smaller group of forty-four subjects made up of twenty-two males and twenty-two females. Thus some subjects were dropped in order to make this matched group. The basis for dropping subjects was the order in which they obtained their respective Information scaled score. The subjects were listed in the order in which they obtained their respective Information scaled score. If any subjects had to be dropped from any category, those who had received that particular scaled score the latest were dropped. (See appendix B.)

The purpose of this design was to set up the two groups so that any difference in score could be attributable to a difference in the experimental conditions because the groups were equated on all the relevant factors. The general level of intelligence was equated by matching a male with a female who had the same scaled score on the Information subtest. Differential ability should again balance out by chance. The position in the order of administration has been equated for males and females so that should not influence the results.

Table XIII shows a summary of the comparison of males and females on the timed subtests. Such a comparison was possible because each subject received two subtests as timed subtests and two subtests as untimed subtests. Thus the two subtests which the male member of each pair received as timed subtests could be compared with the two timed subtests of the female member of the pair. It was found that the males of this sample obtained more scaled scores, accuracy points and time bonus points on the timed subtests than the females did. In addition the least significant difference was significant above the .02 level. A comparison of the differences in variance between the males and females shows that there is a significant difference in variance for the proportion of accuracy points. Since one of the assumptions underlying the use of the t test is that both samples have the same

variance, this significant difference in variance casts some doubt on the results of the t test. As a result the T of the Wilcoxon matched-pairs signed-ranks test was computed since this test makes fewer assumptions than the parametric t test. The differences in scaled scores, accuracy points and time bonus points yielded T s which were significant at or beyond the .01 level. Thus the results of this test tend to agree with the results of the t test. This data then shows that the males tended to obtain a significantly higher scaled score than the females on the timed subtests. This difference is due to a significant difference in accuracy points and time bonus points. The difference in accuracy points is due to a difference in the general level of ability in the areas measured by these subtests. This is because each subtest has been standardized so that the score increases with an increase in the ability measured by the subtest. Since the difference in accuracy points tends to indicate a difference in the level of functioning, the difference in the number of time bonus points could be said to be attributable to two things. First of all, it could be said that it is attributable to faster performance induced in the males by the experimental condition. Thus it could be said that some of the difference between males and females with respect to the timed subtests is due to the fact that the males tended to work faster than the females under timed conditions

TABLE XIII
 PERFORMANCE ON TIMED SUBTESTS,
 MALES COMPARED WITH FEMALES

	Number of Scaled Scores	Proportion of Accuracy Points	Proportion of Time Bonus Points
Mean (males)	25.23	.902	.494
Mean (females)	21.64	.882	.315
t x	3.18	2.963	2.797
Level of Significance	>.01	>.01	>.02 <.01
T x x	33.5	37.25	49
Level of Significance	>.01	>.01	= .01
s (males)	3.35	.052	.207
s (females)	3.58	.108	.223
F	1.1409	4.2160	1.1584
Level of Significance	<.10	>.02	<.10

x t test

xx Wilcoxon matched-pairs signed-ranks test

and thus they earned more time bonus points. However it could also be said that the difference in time bonus points is due to a different level of functioning on the part of the males. This would be backed up by the fact that the difference in accuracy points tends to indicate a higher level of functioning on the timed subtests by the males. Since the time bonus points are only available at the higher levels of functioning, it seems entirely possible that the males could have obtained more bonus points simply because they happened to be able to function on a higher level. Thus it seems that the twenty-two males in this sample functioned at a higher level on the timed subtests than the twenty-two females did and, as a result, differences in the scores are due to differences in the general level of ability in the areas measured by these subtests rather than to a faster performance induced by the experimental conditions.

Table XIV shows a summary of the comparison of the performance of males and females on untimed subtests. The performance on the two untimed subtests by the male member of each pair was compared with the similar performance of the female member of that pair. An examination of the means of scaled scores, proportion of accuracy points and proportion of time bonus points shows that the males had slightly higher averages in all three instances. However the t test shows that none of these differences are even significant at the

TABLE XIV
 PERFORMANCE ON UNTIMED SUBTESTS,
 MALES COMPARED WITH FEMALES

	Number of Scaled Scores	Proportion of Accuracy Points	Proportion Of Time Bonus Points
Mean (males)	25.09	.900	.479
Mean (females)	24.36	.869	.455
t x	.99	.833	.275
Level of Significance	>.40 <.30	>.50 <.40	<.10
T x x	91.5	78	126
Level of Significance	<.05	<.05	<.05
s (males)	3.69	.080	.262
s (females)	4.93	.136	.259
F	1.7812	2.8697	1.0221
Level of Significance	<.10	>.03 <.01	<.10

x t test
xx Wilcoxon matched-pairs signed-ranks test

.10 level so the differences are regarded as insignificant. An examination of the variance shows that there is a significant difference between the two groups on accuracy points. Since the t test assumes that there is no significant difference in variance, this casts some doubt on the results of the t test. As a result the T of the Wilcoxon matched-pairs signed-ranks test was computed as it makes fewer assumptions than the t test. The results of this test also show that there are no significant differences between the means of scaled scores, accuracy points and time bonus points. However the results which were obtained could possibly have been distorted because of the use of the smaller group. In general this aspect of the study is to be regarded as only secondary in importance because only forty-four out of the seventy subjects were used and it seems there was a significant difference between the males and females in the level of ability on the timed subtests.

CHAPTER V

SUMMARY AND CONCLUSIONS

Summary. This study attempted to study the effects which different conceptions of the time element involved in four subtests of the Wechsler Adult Intelligence Scale (WAIS) might have on the test performance. The following four subtests, Arithmetic, Block Design, Picture Arrangement and Object Assembly were selected because scores were given on them for speed of performance as well as for accuracy. The subjects who took part in this experiment were students in two introductory psychology classes at a University level. A matched pair design was used and thirty-five pairs were matched on the basis of scaled score on the Information subtest. In order to obtain thirty-five pairs of subjects, a total of seventy-four subjects were run. The statistical treatment dealt only with the thirty-five pairs as the four unmatched subjects were disregarded.

Two subtests for each subject were timed with a stop watch in plain sight so he could easily realize that he was being timed. This was to induce the attitude that not only accuracy but also speed was important. Two other subtests were timed by a hidden stop watch so that the subject would not realize he was being timed. This was to induce the idea that accuracy was the main emphasis of these subtests. It

was hypothesized that the subjects who realized they were being timed would tend to think that not only accuracy but also speed was important and as a result they would gain more time bonus points than those who thought that accuracy was the main emphasis.

A comparison was made of the performance of each subject on their two timed and untimed subtests. This consisted of a comparison of the totals obtained on the two timed subtests with the totals obtained on the two untimed subtests.

The data were further treated to determine the effect of giving each of the individual subtests as timed or untimed subtests. Each person who had taken a subtest as a timed subtest was paired with an individual who had the same scaled score on the Information subtest and had taken the subtest in question as an untimed subtest. This resulted in a comparison of thirty-five pairs for each subtest.

The data were divided into two sex groups. Then comparisons were made to see how each of the sexes performed on the two experimental conditions. The totals obtained on each individual's two timed subtests were compared with the totals on his two untimed subtests.

Finally, a smaller matched group of forty-four subjects was made so that the performance of the males on timed subtests could be compared with that of the females on the timed subtests. The same comparison was made for the two

untimed subtests.

Conclusions. When each subject's two timed subtests were compared with his two untimed subtests it was found that the average number of scaled scores was greater for the untimed subtests. There was no significant difference in the number of accuracy points. However significantly more time bonus points were obtained on the untimed subtests. Thus, contrary to the hypothesis, it seems that the subjects tended to work slightly faster when they did not realize they were being timed and thus obtained a significantly higher scaled score due to obtaining more time bonus points. The effect which this difference would have on the full scale IQ for the majority of the subjects in this study was found to be about two IQ points. Thus it was concluded that such a difference would not result in a different appraisal of the full scale IQ in an everyday testing situation.

The results obtained when the individual subtests were given as timed or untimed subtests were studied and it was found that none of the subtests showed a significant difference between the two experimental conditions. It was concluded that possibly a different experimental design and a larger group of subjects for each subtest would enable one to determine if there were slight differences on the individual subtests.

It was found that a comparison of each male's two timed subtests with his two untimed subtests did not show any significant differences between the two experimental conditions. However it was found that the females obtained significantly more scaled scores on the untimed subtests. There was no significant difference in the number of accuracy points while there was a significant increase in time bonus points on the untimed subtests. Thus it appears that females obtain a significantly higher scaled score on untimed subtests due to obtaining more time bonus points. However this increase would only result in an increase of about one IQ point in the full scale IQ of the majority of the subjects in this study. Thus it was concluded that this difference was not great enough to result in a different appraisal of a person's level of intelligence in an everyday testing situation.

A comparison of the performance of the males and the females on the timed subtests showed that the males obtained a significantly higher scaled score. This was due to significantly more accuracy points and also time bonus points. When the two sexes were compared on the untimed subtests no significant differences were found. It was concluded that the differences on the timed subtests were due to a significant difference in the level of intelligence of the smaller matched group.

Recommendations. The subjects used in this study were all University students. Thus it seems that they may have been more accustomed to testing situations than the general public. As a result, they may not have been influenced by the difference in experimental conditions as much as most people would. If this topic is to be followed up, studies should be done to investigate this phenomenon for other groups. Perhaps greater differences will show up in other age and educational groups.

The investigation of this phenomenon in the testing of mental patients may be a fruitful area of study. It seems possible that patients having different disorders may react differently to the different modes of timing and perhaps the results obtained on normal subjects would be somewhat exaggerated.

If the test manuals are to be really precise they should give the method of timing used for the normative sample. Then all examiners should use this one method. This would make only a small difference in the full scale IQ of the subjects in our sample. However it would be the more scientific approach. In addition it may be possible that further investigation may find larger differences in other groups.

BIBLIOGRAPHY

BIBLIOGRAPHY

1. Anastasi, A. Psychological Testing. New York: The Macmillan Co., 1954. pp. 306-327.
2. Brown, M.H., and Bryan, E. "Sex Differences in Intelligence", Journal of Clinical Psychology, 11:303-304, 1955.
3. Derner, G.F., and Aborn, M. "An Administration Board For The Wechsler Bellevue-Object Assembly Subtest", Journal of Consulting Psychology, 14:71-72, 1950.
4. Fisher, R.A., and Yates, F. Statistical Tables for Biological, Agricultural and Medical Research. London: Oliver and Boyd, 1948. Table III.
5. Goolishian, H.A., and Foster, A. "A Note On Sex Differences On The Wechsler-Bellevue Test", Journal of Clinical Psychology, 10: 298-299, 1954.
6. Guertin, W.H. "The Effect of Instructions and Item Order on the Arithmetic Subtest of the Wechsler-Bellevue", The Journal of Genetic Psychology, 85:79-83, 1954.
7. Gurvitz, M.S. "Some Defects of the Wechsler-Bellevue", Journal of Consulting Psychology, 16:124-126, 1952.
8. Jastak, J. "Psychometric Scatter Analysis", Psychological Bulletin, 46:177-197, 1949.
9. Johnson, T.F. "Some Needs in Research with the Wechsler-Bellevue Scale", The Journal of General Psychology, 41:33-36, 1949.
10. Luchins, A.S. "On Certain Misuses of the Wechsler-Bellevue Scales", Journal of Consulting Psychology, 10:109-111, 1946.
11. McNemar, Q. Psychological Statistics. New York: John Wiley and Sons, 1949. 364 pp.
12. Norman, R.D. "Sex Differences and Other Aspects of Young Superior Adult Performance on the Wechsler-Bellevue", Journal of Consulting Psychology, 17:411-418, 1953.
13. Rabin, A.I., and Guertin, W.H. "Research With the Wechsler-Bellevue Test", Psychological Bulletin, 48:211-248, 1951.

14. Rapaport, D., and others. Diagnostic Psychological Testing. Chicago: The Year Book Publishers, Inc., 1945. Vol. I pp. 37-318.
15. Robertson, J.P.S. and Batchelder, K.J. "Cultural Aspects of the Wechsler Adult Intelligence Scale in Relation to British Mental Patients", The Journal of Mental Science, 102:612-618, 1956.
16. Sappenfield, B.R.A. "A Rapid Method of Placement of Wechsler Object Assembly Pieces", Journal of Clinical Psychology, 3:301, 1947.
17. Shannon, W. and Rossi, P.D. "Suggestions for Efficient Presentation of the Wechsler-Bellevue Object Assembly Subtest", Journal of Clinical Psychology, 8:413-415, 1952.
18. Siegel, S. Nonparametric Statistics For The Behavioral Sciences. New York: McGraw-Hill Book Co., Inc., 1956. pp. 75-83.
19. Siegman, A.W. "The Effect of Manifest Anxiety on a Concept Formation Task, a Nondirected Learning Task, and on Timed and Untimed Intelligence Tests", Journal of Consulting Psychology, 20:176-178, 1956.
20. Snedecor, G.W. "Statistical Methods" Ames: The Iowa State College Press, 1946. pp. 222-225.
21. Strange, F.B., and Palmer, J.O. "A Note on Sex Differences on the Wechsler-Bellevue Tests", Journal of Clinical Psychology, 9:85-87, 1953.
22. Wechsler, D. Manual for the Wechsler Adult Intelligence Scale. New York: The Psychological Corporation, 1955. 110 pp.
23. _____ Manual: Wechsler Intelligence Scale For Children. New York: The Psychological Corporation, 1949. 114 pp.
24. _____ The Measurement and Appraisal of Adult Intelligence. Baltimore: The Williams and Wilkins Co., 1958. 297 pp. (4th Edition).
25. _____ The Measurement of Adult Intelligence. Baltimore: The Williams and Wilkins Co., 1944. 258 pp. (3rd Edition).

26. Wechsler, D. The Wechsler-Bellevue Intelligence Scale, Form II: Manual for Administering and Scoring the Test. New York: The Psychological Corporation, 1946. 96 pp.

APPENDIX

APPENDIX A

DATA FOR SUBJECTS IN CONDITION I

Pair No.	Inf.	Arith.			B.D.			P.A.			O.A.		
		Scaled Score	Accur. Points	Bonus Points	Scaled Score	Accur. Points	Bonus Points	Scaled Score	Accur. Points	Bonus Points	Scaled Score	Accur. Points	Bonus Points
1	12	9	10	0	9	28	0	9	22	0	11	29	5
2	14	17	14	4	15	40	6	9	22	0	9	23	7
3	15	13	12	2	11	36	0	9	18	2	10	27	6
4	13	14	12	3	17	40	8	11	26	1	13	29	10
5	16	14	12	3	16	40	7	12	26	3	12	27	10
6	13	13	12	2	16	40	7	11	26	0	9	21	8
7	13	8	9	0	5	16	0	12	28	0	7	21	2
8	15	13	12	2	16	40	7	9	22	0	14	29	11
9	13	12	11	2	10	30	3	9	20	0	9	25	5
10	14	15	13	3	12	36	4	9	22	0	8	21	5
11	15	14	13	2	17	40	8	12	26	2	18	29	15
12	16	15	14	2	17	40	8	14	30	2	15	29	12
13	12	10	10	1	14	40	5	13	28	3	15	29	12
14	14	11	11	1	11	34	2	12	28	1	10	29	4
15	13	16	14	3	13	36	6	13	30	0	10	27	6
16	13	13	12	2	17	40	8	14	30	2	9	24	6
17	13	14	12	3	12	36	5	15	32	1	8	25	2
18	12	11	11	1	11	32	3	13	28	2	8	21	6
19	13	14	13	2	13	40	3	9	22	0	11	27	7
20	14	11	11	1	16	40	7	13	30	1	8	19	6
21	14	17	14	4	15	40	6	11	26	0	17	29	14
22	11	11	11	1	13	40	3	11	26	1	10	29	4
23	13	13	12	2	12	36	3	15	32	1	11	29	6
24	13	13	12	2	16	40	7	12	28	1	9	25	3
25	11	12	11	2	11	36	2	13	28	3	7	23	1
26	12	12	11	2	7	22	2	11	26	1	7	22	0
27	14	15	13	3	17	40	8	14	32	0	9	25	5
28	13	12	11	2	10	32	0	10	24	1	15	29	12
29	12	14	13	2	15	40	6	11	26	1	13	29	9
30	14	13	12	2	15	40	6	15	30	3	12	29	7
31	12	12	11	2	7	24	0	9	20	0	5	15	1
32	15	10	11	0	14	40	4	17	32	3	15	29	12
33	13	10	11	0	10	32	0	12	28	0	9	29	1
34	14	13	12	2	10	32	2	12	28	1	8	21	5
35	14	9	10	0	12	36	4	12	28	1	13	29	9

APPENDIX A (CONTINUED)

DATA FOR SUBJECTS IN CONDITION II

Pair No.	Inf.	Arith.			B.D.			P.A.			O.A.		
		Scaled Score	Accur. Points	Bonus Points	Scaled Score	Accur. Points	Bonus Points	Scaled Score	Accur. Points	Bonus Points	Scaled Score	Accur. Points	Bonus Points
1	12	15	13	3	9	28	0	8	18	0	15	29	12
2	14	16	13	4	13	36	6	12	26	2	17	29	14
3	15	15	13	3	11	36	2	18	32	4	16	29	13
4	13	10	10	1	10	32	2	11	26	1	9	27	3
5	16	13	13	1	16	40	7	13	28	2	14	29	11
6	13	11	11	1	12	36	5	10	22	1	12	28	9
7	13	14	12	3	13	38	5	12	26	2	11	29	6
8	15	12	12	1	11	32	3	16	32	2	11	29	5
9	13	13	12	2	16	40	7	12	28	1	17	29	14
10	14	14	12	3	16	40	7	9	22	0	13	29	10
11	15	11	11	1	12	36	3	9	22	0	8	22	3
12	16	15	13	3	17	40	8	14	30	2	14	29	11
13	12	15	13	3	14	40	5	14	30	2	15	29	12
14	14	11	10	2	12	36	4	15	32	1	16	29	13
15	13	10	10	1	9	28	1	11	26	0	11	29	6
16	13	11	12	0	13	36	6	15	32	1	15	29	12
17	13	9	10	0	10	32	0	9	22	0	10	22	9
18	12	13	12	2	12	36	3	14	30	2	10	29	4
19	13	13	13	1	11	36	2	9	22	0	10	29	3
20	14	12	11	2	6	20	0	9	22	0	3	9	0
21	14	13	12	2	11	36	0	9	22	0	10	29	3
22	11	13	13	1	8	24	2	7	16	0	6	18	2
23	13	13	12	2	11	36	0	11	26	1	8	21	5
24	13	15	13	3	15	40	6	14	30	2	12	27	10
25	11	10	10	1	12	36	3	12	26	2	12	29	8
26	12	11	11	1	11	32	3	15	32	1	13	29	10
27	14	16	14	3	11	32	3	16	32	2	11	27	7
28	13	15	13	3	12	36	4	12	28	1	13	29	9
29	12	14	13	2	11	34	2	9	20	0	9	21	8
30	14	16	13	4	14	40	4	12	28	1	12	27	9
31	12	9	10	0	9	28	2	10	24	0	7	21	2
32	15	14	13	2	14	40	5	14	30	2	13	29	10
33	13	15	13	3	15	40	6	12	26	2	14	29	11
34	14	8	9	0	11	36	2	10	24	1	9	21	7
35	14	12	12	1	10	32	2	13	30	0	12	27	10

APPENDIX B

SMALLER MATCHED MALE--FEMALE GROUP

CONDITION I

Pair Number	Males			Females		
	Information Score	Order of Adminis- tration	Included in This Group	Information Score	Order of Adminis- tration	Included in This Group
1	11	42				
	11	50				
	12	22	X	12	1	X
				12	33	
				12	51	
2 3 4 5 6 7 8 9 10				12	57	
				12	61	
	13	16	X	13	4	X
	13	32	X	13	9	X
	13	35	X	13	12	X
	13	48	X	13	27	X
	13	54	X	13	30	X
	13	64	X	13	44	X
	14	2	X	14	23	X
	14	17	X	14	37	X
11	14	41	X	14	68	X
	14	52				
	14	58				
	14	72				
	15	3	X	15	63	X
	15	14				
	15	19				
	16	7				
	16	21				

APPENDIX B (CONTINUED)

SMALLER MATCHED MALE-FEMALE GROUP

CONDITION II

Pair Number	Males			Females		
	Information Score	Order of Adminis- tration	Included in This Group	Information Score	Order of Adminis- tration	Included in This Group
12	12	40	X	11	45	
				11	66	
				12	6	X
				12	25	
				12	53	
				12	60	
13	13	13	X	12	62	
				13	10	X
				13	11	X
				13	29	X
				13	34	X
				13	46	X
				13	55	X
				14	20	X
				14	38	X
				14	47	X
22	15	18	X	14	56	
				14	70	
				14	73	
				15	8	X
				15	67	
				16	36	

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